

if evaporation pans of a temporary nature constructed on the lake shore and from enclosed sections of the lake bed on which salt forms so to speak spontaneously.

A Kyar is a salt work constructed in the bed of the lake by enclosing a rectangular space with an embankment of lake mud from five to seven feet in height pitched with stone to protect it from the main body of lake water. Within the enclosure large solar evaporation pans are excavated with pathways between and brine is run into these pans from the lake by gravitation to a depth of from twelve to sixteen inches. Evaporation by solar heat (and the heat at the lake during the summer months is intense and continuous) results in the precipitation of salt which forms in a soft crust from two to three inches in thickness on the bed of a pan. When the salt is ready for extraction and this occurs on the brine reaching a density of about 30° Beaume labourers enter

at the most perfect form of crystal is obtained from a depth of about twelve inches of saturated brine with a density of 25° Beaume a greater or a lesser depth of brine results in the production of smaller and irregular crystals. A salt work of the type described permits of manufacture being carried on even when the lake is so full of brine that a sufficient area of the shore is not available for the production by other methods the supply of brine for the pans can be so regulated and manufacture can be carried on in such a manner as to obtain the best description of salt the lake is capable of producing and during a year of scanty rainfall the pans in it can be filled for a full crop of salt before the small quantity of brine in the lake recedes towards its centre. There are at present eleven of these salt works at the lake ten in the vicinity of the town of Sambhar at the eastern end and one near Nawa on its north western shore. The size of their rectangles varies from 1681 feet by 951 feet to 4150 feet by 1446 feet. The smallest enclosure contains 20 solar evaporation pans each 421 feet by 152 feet and an evaporating surface of 28½ acres the largest has 60 pans each 670 feet by 700 feet and an evaporating surface of 184½ acres. The entire evaporating surface of the eleven existing enclosures covers an area of nearly 736 acres and during a good manufacturing season with all conditions entirely favourable their productive capacity is about 200 tons an acre. The brine which remains in the pans of the enclosures is pumped out into the lake by centrifugal steam pumps and at the close of a manufacturing season the pans are cleaned out and prepared for the next year's crop.

When after the close of the rainy season the brine of the lake begins to recede towards its centre shallow solar evaporation pans about 100 feet in length by 50 feet in breadth are made along the line of the lake shore by scraping aside the soft surface mud and with it enclosing rectangles with ridges of about a foot in height. Narrow channels are run from these pans to the water's edge and the brine is lifted into them with the aid of slung baskets lined with skins and each worked by two men. The brine in the pans is kept at a depth of three or four inches until a sufficiency of salt has precipitated. The salt is scraped up by means of small pieces of plank attached to long handles is placed in conical heaps near the pans and is finally carried on carts and animals to storage grounds above high water mark and there stored in oblong heaps similar to those in which the salt of the Kyars is placed the quantity in each heap amounting to as much as about 4000 tons. The salt produced in this manner is white and of good quality but the crystals are small owing to the shallow depth of brine in which they are raised. During a favourable year from 4000 to 5000 of these pans are worked and occupy a length of about 15 miles of the lake shore.

Marketable salt is obtained from the bed of the lake in the following manner. When the brine of the lake has reached a high specific gravity and is beginning to recede towards the lake centre it is enclosed within sections of the lake bed by means of rough retaining walls from eighteen inches to two feet in height built of double lines of stakes lined with grass (*Saccharum Sata*) and the space between about two feet filled with lake mud. The sections of the lake bed so enclosed are situated within easy distance of the shore and where the retaining walls are not likely to be affected by the main body of water when this is agitated by storms and strong winds. The mud of the lake even within a short distance of the shore is as much as two feet in depth and it is so soft that it is not practicable to collect salt in heaps except at places not far below high water mark. Salt which forms in these enclosures has therefore to be carried by labourers in baskets to points on the shore where the ground is hard enough to admit of its being collected in quantity and consequently it is not economical to work beyond a certain point in the lake bed as the cost of carriage of salt by labourers increases in proportion to the distance traversed. In addition to this though the water in the lake is shallow its extent is so great that this considerable force when agitated by strong winds and returning winds built up on a certain distance from the shore are likely to be swept away. An enclosure of the kind described having been constructed labour is made to mount in the brine in such quantity as will result in a depth of about twelve inches at saturation point (25° Beaume) and this is done by admitting a fresh supply at intervals when the brine of the main lake is banded up against the enclosure by a favourable wind. When the salt is ready for removal narrow paths are made by placing layers of grass upon the soft mud of the lake bed and these are used by labourers for entering the enclosure in lifting it with basket loads of salt. Within the enclosure the men wade into the black mud carefully lift the crust of salt (which is from two to three inches in thickness) by plying their cut and fingers below it and collect it in their baskets. In these it is carried along the pathways already described to the nearest point where firm ground is available on the shore and is there collected in conical heaps. It is finally conveyed on carts and animals to storage grounds above high water mark where it is stored in the same manner as the produce of the solar evaporation pans worked on the lake edge in fact the same grounds are used for the storage of both descriptions of salt. This spontaneous salt is of good quality and the crystals are similar in shape and size to those obtained from the Kyars though the colour is not so white. During a

salt is sent to them expeditiously by railway. In Central India the Indian Midland Railway also receives salt revenue in this manner at different railway stations and the system conduces to the cheap distribution of salt by which the consumer benefits. The salt of the lake is widely distributed. It is largely consumed in Rajputana, Central India and the North Western Provinces and Oudh. It is exported into the Panjab and the Central Provinces and is also consumed in the Himalayan State of Nepal.

The Sambhar lake of which the writer was in charge for five years is not a desirable place of residence. The country is arid, the heat great and when the lake is drying up the stench from decaying insect and vegetable forms which flourish when the brine is weak and die off as its density rises is very offensive. But the scenery shortly after the rainy season is worth a visit. When the salt officers have settled the spectator Sambhar and beyond a vast sheet of water bounded with the white houses of the town of Nawa nestled on a direct line. Nearer he would not see the railway line crossing the eastern end of the lake on a high embankment the large salt works which have been described as snow white heaps of salt of about 7000 tons each dotted here and there and crowds of labourers engaged in the collection and storage of salt. He would also see thousands of flamingoes appearing like pink clouds as they rose in flight. These birds resort to the lake soon after the annual rainfall and live upon the insect life with which the lake teems while the density of the brine is low. They migrate as soon as the specific gravity of the lake increases and all insect and vegetable forms are destroyed by the rising density of the brine. There is however a reverse to this picture as the appearance of the locality is very different during a season of drought. The monsoon rainfall of 1899 failed throughout Rajputana which is suffering at the present from the most severe famine of the century. But little water entered the Sambhar lake and it is at present perfectly dry. It has not been possible to obtain salt from pans on the lake or from the lake bed and but little brine could be taken into the khyars. The country round the lake is at present desolate and a picture of sterility and the stir and bustle usual on the lake works in connection with the collection of salt is wanting. Variations of this kind are to be looked for in the sandy portion of Rajputana where the rainfall is a very uncertain factor.

The Pachbadra salt source is situated in Jodhpur territory and is next in importance to the Sambhar lake as a salt producing locality. Pachbadra is a small town of about 5000 inhabitants on the right bank of the Luni river and at a distance of about 40 miles to the south westward of the city of Jodhpur. The State of Jodhpur is also called *Marwar* the Land of Death and the name is an appropriate one as regards the part of the country in which Pachbadra lies. The town is some distance from the Luni river, a dry water course with a bed of glaring sand except during brief periods of the monsoon when it comes down in flood. The low lying ground between the town and the river is waterless and sterile while to the west and north the interminable sand hills and ridges of the Great Desert begin and extend over a vast area stretching about 100 miles westwards towards Sindh and to a greater distance northward to the Panjab.

Ten miles to the westward of the Luni river and about two miles in the same direction from the town of Pachbadra a large sandy valley takes its rise from the desert sand hills and extends for a distance of about twelve miles with a breadth varying from one and a half to two miles. It follows a south westerly course parallel with the Luni for some miles and then turns to the eastward and joins that river. The eastern edge of the valley is bounded by rising ground of hard soil capped here and there by hills and ridges of blown sand and sloping toward the sand hills of the desert form one unbroken line. The origin of this stratum in which the salt is manufactured is that in post tertiary times an arm of the sea extended up the Luni. Jodhpur the Runn of Kutch being of course an inland sea and that source is now situated was an inlet of the sea. The present height of Pachbadra above the sea is about 360 feet and the sand of the desert can apparently only be satisfactorily explained by supposing that it was derived from a former coast line.

The Pachbadra salt source occupies a section of about 3 miles in length by 3 miles in breadth of the upper part of the valley. The stratum in which the salt is manufactured is the present surface of the valley. The stratum in which the brine springs occur is covered by a layer of coarse sand and gravel and this was evidently the former bed of the depression. Above this there is a stratum of sand and clay then another of layers of sand silt and salt crust above this a stratum of layers of silt and desert sand with lines of washed sand and salt crust between and finally a surface stratum of blown desert sand. These indications go to show that in the past the bed of the valley was about 8½ feet below its present level that it was a salt marsh which was periodically inundated and in which salt formed during the dry season of each year and that it has been filled up to its present level by deposits of blown sand. Bounded as the depression is to the westward by a vast sea of desert sand it would have been overwhelmed long ere this by advancing sand waves but for the curious fact that the strong winds which prevail during the summer months blow from a south westerly direction and as these pass over comparatively hard ground in the vicinity of the Luni river their effect in filling up the valley with sand has been comparatively slow. The present appearance of the upper part of the valley where salt is manufactured is that of a slightly undulating sandy plain on which clumps of *Salvadora oleoides* occur here and there. Lower down the valley the accumulation of sand is not as yet so great and the general level is more uniform and barren. In this lower section also brine is found below the surface and formerly salt used to be made at two localities but production is now confined to the upper part of the valley.

Local tradition in regard to the past history of the valley is in accordance with the illustrations and evidence. It is related that in former times when the country was more sparsely populated that the bed of the valley was a saline marsh in which salt used to deposit during the dry and

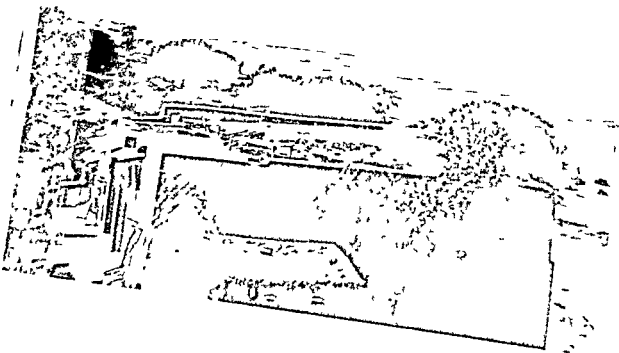
THE SALT INDUSTRY OF RAJPUTANA

has formed as to render the daily moving of the ridges laborious and difficult. It is collected in heaps and then removed to a place of storage on its edge. Didwana salt is white and clean but owing to the gravity of the well brine and rapid precipitation its crystals are always small. It contains from 95 to 100 per cent of chloride of sodium. The salt pans are about 80 feet square and are each capable of producing 10 to 12 tons of salt every 15 days. There are two clusters of factories, one of 222 pans in 146 acres on the southern edge of the depression covering an area of about one half by a quarter of 1 mile and the western edge where 25 pans and 7 brine wells are scattered along a line of about 400 yards. But few pans have been constructed in recent times and the wells have been in existence for centuries. The greater number of the salt factories have been constructed in the area of about one half by a quarter of 1 mile and the southern western end where the brine is more abundant and of better quality. It is said that manufacture has been carried on by the present class of workers for about 400 years and there is no tradition of salt having been produced prior to that period. But in 1878 an experimental well was sunk on the eastern edge of the depression somewhat high level and an excavation 14 feet in diameter and 10 feet in depth its bottom was just at present surface level. This well was about 3 feet in diameter and 10 feet in depth its bottom was just at present surface level. This well was about 3 feet in diameter and 10 feet in depth its bottom was just at present surface level. This well was about 3 feet in diameter and 10 feet in depth its bottom was just at present surface level.

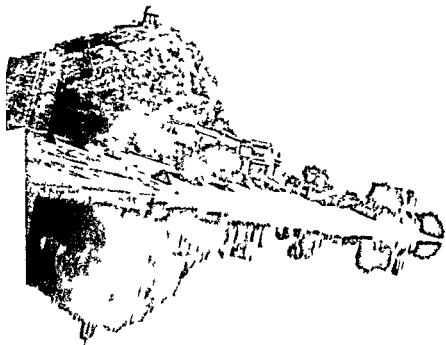
In 1878 the British Government at this source is probably of great antiquity. It was quite different to the wells at present followed by the *Desmuts* (as the manufacturers are called) are the only ones of the kind in the district. There is no extension of work as the factories which were existing in 1878 are now producing 10 to 12 tons of salt every 15 days. Indeed much more than is needed for the district. The supply of brine is abundant and inexhaustible and the work is confined to about two or three months in each year. The manufacture can be carried on continuously (the rainy season is the best time for it) and though the average yield is about 15 inches yet the yearly quantity varies greatly fluctuating from as much as 12 inches to as little as 3 inches. The rainfall has no effect upon the salt. The quantity of salt produced at this source is estimated by means of the annual payment of Rs 200,000 (about £13,000) and it has been worked for centuries. The quantity of salt produced at this source is estimated by means of the annual payment of Rs 200,000 (about £13,000) and it has been worked for centuries. The quantity of salt produced at this source is estimated by means of the annual payment of Rs 200,000 (about £13,000) and it has been worked for centuries.

It has been produced at this source. Payment is effected for the quantity in each of these is estimated by means of the least moisture (by which it is readily affected owing to its salinity) and salt has to be removed to the sandy edge of the depression for the convenience of the trade. It has already been remarked that the mud of this source is very like that of the Sambhar lake and it is liable to become heated to a high temperature in a similar manner. Low in the centre of the depression and followed by intense heat. One of the native establishments attempted to cross the depression in the heat of the day at a narrow part where the mud and water were less deep than elsewhere and up to a little below his knees. When he got about half way across he found that the soft mud was scolding him and shrieked for help. His comrades on the hard ground near the edge dare not venture into the mud and urged him to pass through as quickly as he could. He struggled through the heated mud with great difficulty and fell exhausted on the shore with his feet and legs terribly scalded. He was carried to hospital and some months elapsed before he was able to walk. The cost of manufacturing Didwana salt and storing it for sale on the edge of the depression is tenpence a ton and it is sold at the rate of 1s 8d a ton. The railway has not been extended to this source and the nearest salt trading station is 40 miles distant at Nawana on the Sambhar lake. The trade of the source amounts to 12,000 tons annually. Didwana salt is consumed in the north western portion of the Jodhpur State in the district south of the Sambhar lake. The principal trade is with the eastern districts of the Punjab to which the salt is conveyed partly across the intervening desert country and partly by way of the Sambhar lake and the principal sources in Rajputana. Salt for the surrounding country is carried by the same route. The principal sources of salt are situated in the State of Jaisalmer. These are worked by the officials of the State. The principal source of salt is situated in the heart of the southern desert.



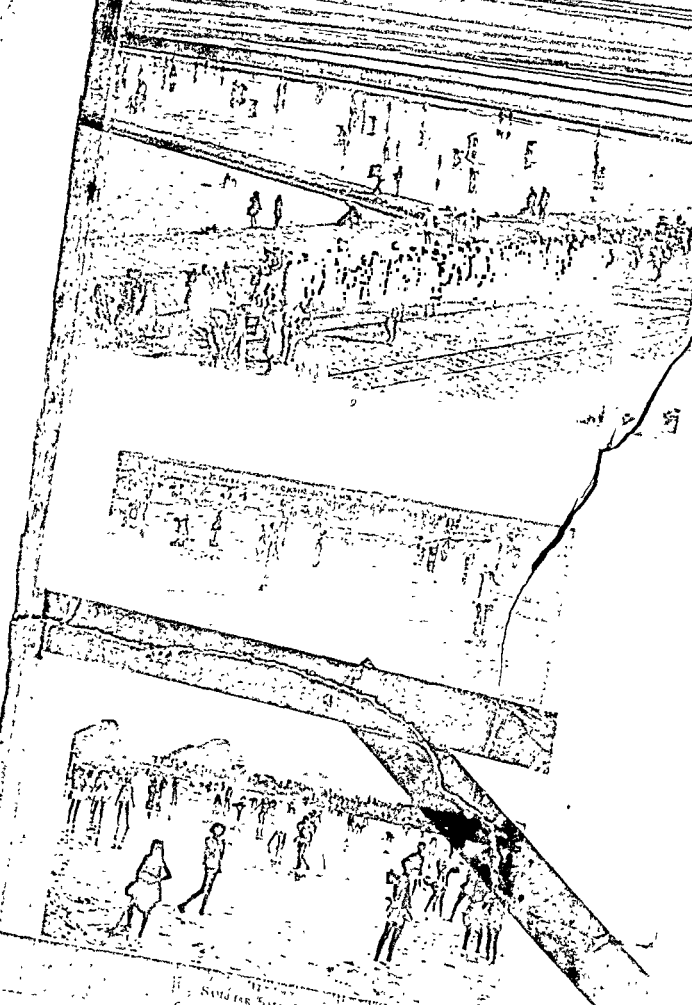


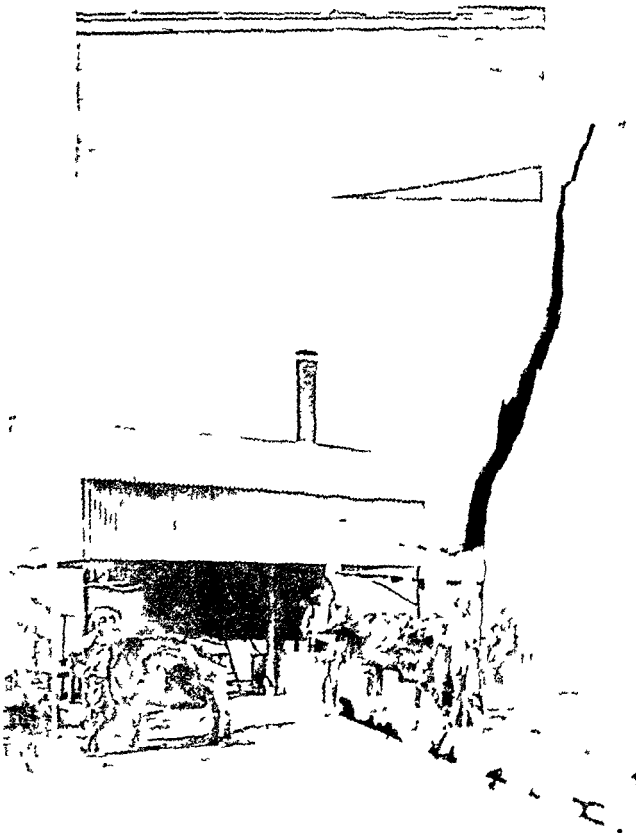




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13
SALT LAKE

View of part of the house & Nawa
Cave

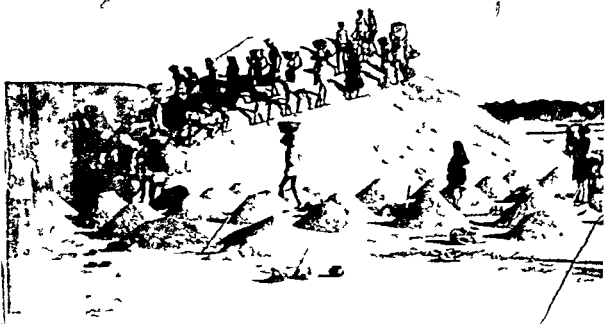




17 Salt being prepared for estimation



18 Estimation of salt on a large platform (Ky)



SAMBHAR SALT LAKE

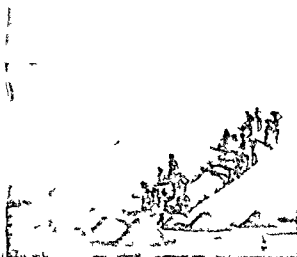
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21 Laborers carrying salt



22 Salt being stored



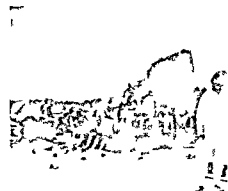
23 Another view of salt being stored



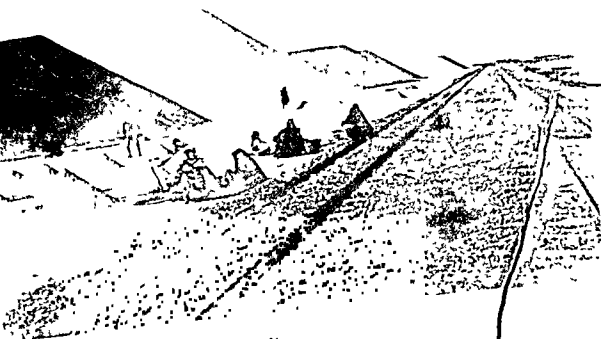
26 Bays being filled with salt



27 Large bay being filled with salt



28 Ponds being filled



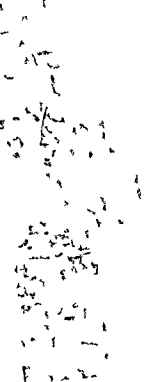
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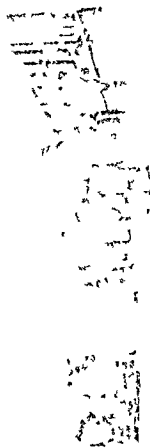
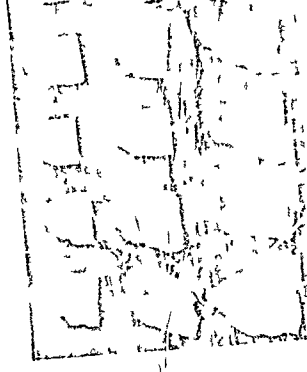
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—SAMBHAR SALT LAKE.

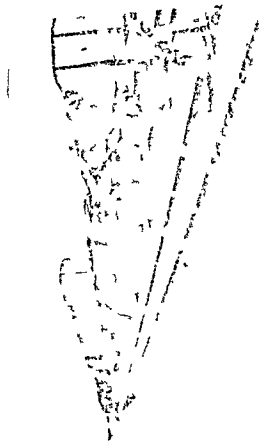
57 (2). The photograph on a railway siding at the Sambhar h.
 (2) 1 is the building with a lot of despatch boxes.

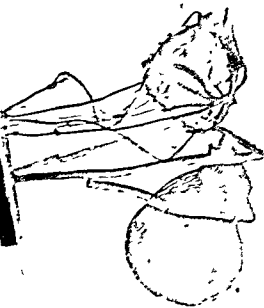


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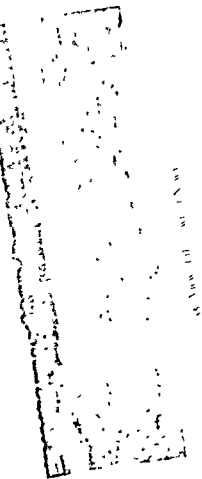
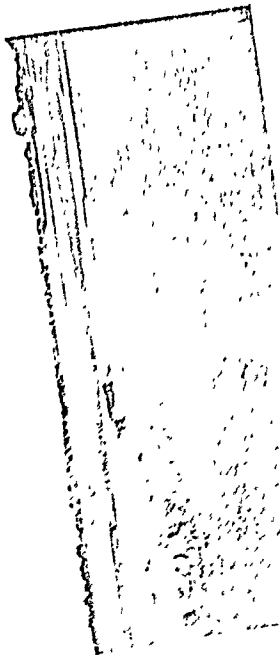


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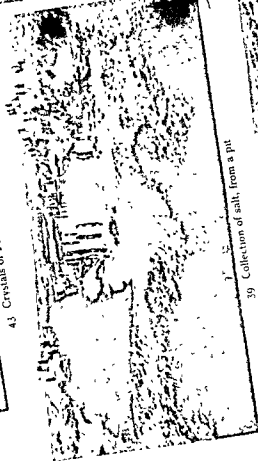


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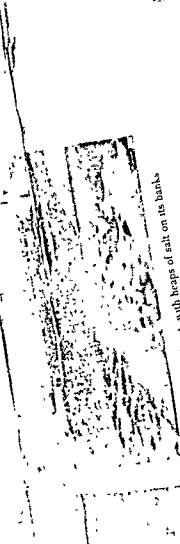




43 Crystals of Pachhadra salt.



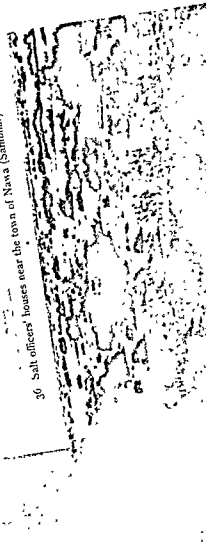
39 Collection of salt, from a pit



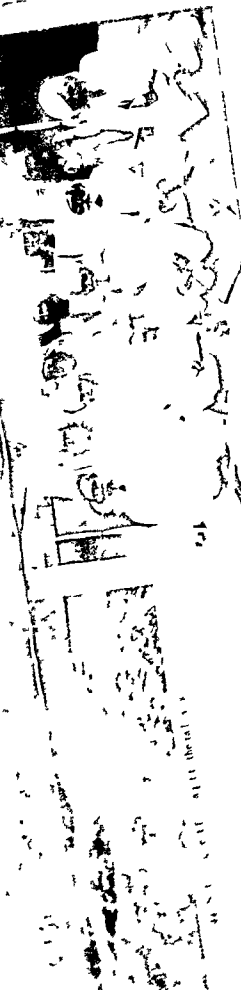
40 View of a salt pit, with heaps of salt on its banks



36 Salt officers' houses near the town of Nawa (Samthar)

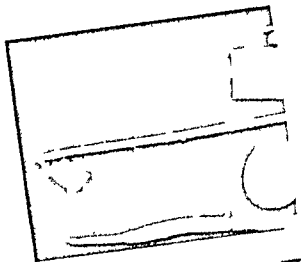
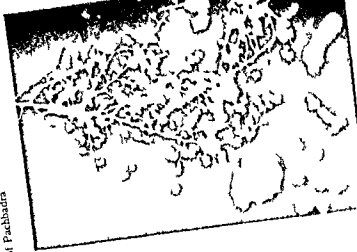
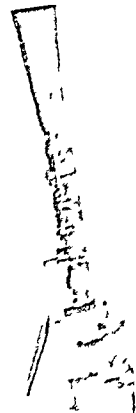


View southward

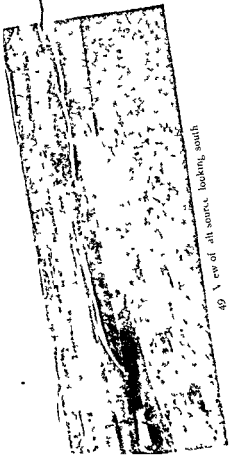


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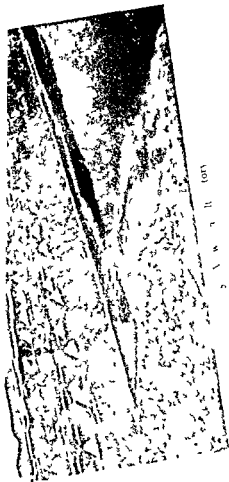
47 Salt man f



Expenditure of Salt in the year 1950-51



49 View of all source looking south



5 View of all source



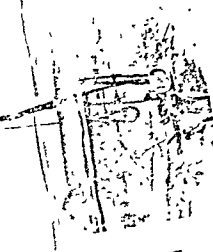
48 Temple

61 Source of all





55 Salt manufactured in Didiwana



56. Lame well



57 Crystals of Didwana salt (magnified)



58. Off the border



59 Salt bed shown bed out to traders

